

AMENDMENTS TO THE CLAIMS

Please amend claims 5-7, 9-11 and 13-16 as indicated.

1-4. (canceled)

5. (currently amended) A multi-stage distillation apparatus includes a plurality of evaporators connected in series for staged operation in a rising film evaporation process wherein the evaporators are disposed in a compact concentric arrangement, the apparatus comprising:

a ~~ring (annular) shell and tube~~ first stage evaporator ~~of ring shell and tube construction~~ including a first annular vertical tube bundle, having tubes supported and sealed by a first upper tubesheet and a first bottom tubesheet, an external wall and an internal wall enclosing the first tube bundle, said internal wall having an upward extension over the upper tubesheet and the external wall having a downward extension adjacent the bottom tubesheet and fastened to a base, the base including a feed chamber communicating through the bottom tubesheet with the tubes of the first tube bundle for supplying the tubes with a flow of undistilled water for partial vaporization, means for conducting a heated liquid against the tubes of the first tube bundle and partially vaporizing the undistilled water therein, and the first stage evaporator having a first stage vapour vapor chamber above the upper tubesheet and a feed chamber below the bottom tubesheet in open communication with the tubes of the first tube bundle for receiving therefrom heated water vapor and residual undistilled water, the upward extension of the internal wall directing the heated vapor to a subsequent stage evaporator tube bundle; and

a ~~second~~ final stage evaporator, being also a pre-final stage condenser, including a ~~second~~ final cylindrical vertical tube bundle, having tubes supported and sealed by a ~~second~~ final upper tubesheet and a ~~second~~ final bottom tubesheet, the final bottom tubesheet carrying a final stage floating head connected to receive, by gravity feed means from a final stage vapor chamber, residual undistilled water vacuumed from a prior stage

evaporator to the final stage vapor chamber, the final floating head communicating with the tubes of the final stage evaporator cylindrical tube bundle for delivering said residual undistilled water thereinto, the second final upper tubesheet having a diameter at least 30% larger than the second final bottom tubesheet, the final upper tubesheet defining a lower wall of the final stage vapor chamber, in open communication with the final tube bundle for receiving therefrom additional water vapor for condensation to condensate and residual undistilled water for discharge from the distillation apparatus, and having a first floating head on the second tubesheet and a central tube connecting with the floating head for directing condensate thereto, and a [[first]] final external ~~armour~~ armor shell surrounding the final cylindrical tube bundle and engaging the [[inner]] internal wall of the shell and tube an adjacent evaporator to direct heated vapour vapor from the adjacent evaporator to pass through the second final cylindrical tube bundle for heating the tubes and causing partial condensation of the heated vapor on the tubes of the final stage evaporator with said partial vaporization of the residual undistilled water in the tubes of the final tube bundle, and further including means for drawing off condensate from the partially condensed vapor from the final stage evaporator.

6. (currently amended) An apparatus as in claim 5 and further including:

a [[third]] second stage evaporator and first stage condenser having including a [[third]] second intermediate vertical ring tube bundle, having tubes supported and sealed by a [[third]] second upper tubesheet and a [[third]] second bottom tubesheet, the second bottom tubesheet carrying a second stage floating head connected to receive, by gravity feed from a second stage vapor chamber above the second upper tubesheet, residual undistilled water vacuumed from the first stage evaporator to the second stage vapor chamber, the second stage floating head communicating with tubes of the second stage evaporator ring tube bundle for delivering said residual undistilled water thereinto, a second stage internal wall welded to the [[third]] second upper tubesheet, said second stage internal wall having an upward extension over the [[third]] second upper tubesheet, and

~~having a second floating head on the fourth bottom tubesheet and partially defining the [[a]]~~
~~second stage vapour vapor chamber above the third upper tubesheet, which is open to~~
~~communication with the second tube bundle for receiving therefrom additional water vapor~~
~~for condensation to condensate and additional residual undistilled water; said [[third]]~~
~~second intermediate vertical ring tube bundle being disposed concentrically between the~~
~~first annular vertical tube bundle of the shell and tube first stage evaporator and the second~~
~~a subsequent cylindrical vertical tube bundle of the second a subsequent evaporator, and a~~
~~second stage external armor shell surrounding the second ring tube bundle and engaging the~~
~~internal wall of the first stage evaporator to direct vapor from the first stage evaporator to~~
~~pass through the second ring tube bundle for partial condensation of the heated vapor from~~
~~the first stage tube bundle on the tubes of the second stage evaporator and said partial~~
~~vaporization of the residual undistilled water in the tubes of the second ring tube bundle,~~
~~and further including means for drawing off condensate from the partially condensed vapor~~
~~from the second stage evaporator.~~

7. (currently amended) An apparatus as in claim 6 and further including:

a ~~fourth~~ third stage evaporator and second stage condenser having including
a ~~fourth~~ third intermediate vertical ring tube bundle, having tubes supported and sealed by
a ~~fourth~~ third upper tubesheet and a fourth third bottom tubesheet, the third bottom
tubesheet carrying a third stage floating head connected to receive, by gravity feed means
from a third stage vapor chamber above the third upper tubesheet, residual undistilled
water vacuumed from the second stage evaporator to the third stage vapor chamber, the
third stage floating head communicating with the tubes of the third stage evaporator ring
tube bundle for delivering said residual undistilled water thereto, a third stage internal wall
welded to the fourth third upper tubesheet, said third stage internal wall having an upward
extension over the fourth third upper tubesheet, and having a third floating head on the
~~fourth bottom tubesheet and partially defining the [[a]]~~ third stage vapour vapor chamber
~~above the fourth upper tubesheet; said fourth third intermediate vertical ring tube bundle~~

being disposed concentrically between said ~~[[third]]~~ second intermediate vertical ring tube bundle and ~~one of the first annular vertical ring tube bundle of the shell and tube first evaporator and the second~~ final cylindrical vertical tube bundle of the ~~second~~ final evaporator, and a third stage external armor shell surrounding the third ring tube bundle and engaging the second stage internal wall of the second stage evaporator to direct heated vapor from the second stage evaporator to pass through the third ring tube bundle for partial condensation of the heated vapor from the second stage evaporator on the tubes of the third ring tube bundle and said partial vaporization of the residual undistilled water in the tubes of the second ring tube bundle, and further including means for drawing off condensate from the partially condensed vapor from the third stage evaporator.

8. (previously presented) An apparatus as in claim 5 wherein the external wall is fastened to the base by bolting or welding.

9. (currently amended) An apparatus as in claim 5 wherein the first ~~stage vapour~~ vapor chamber is laterally limited by a cylindrical shell and on top by a flange, the feed chamber is laterally limited by the downward extension of the ~~a~~ first external wall, and at the bottom by the base, and on top by a plate, wherein the first upper tubesheet has a diameter larger than the diameter of the first external wall ~~and the upper tubesheet includes an opening for passage of a brine line.~~

10. (currently amended) An apparatus as in claim 6 wherein said second stage ~~vapour~~ vapor chamber is laterally limited by a second cylindrical shell and on top by a connection flange and an external ~~armour~~ armor shell is disposed surrounding the ~~third~~ second intermediate vertical ring tube bundle.

11. (currently amended) An apparatus as in claim 7 wherein said base contains a cylindrical welded support and welded tubes; said third stage ~~vapour~~ vapor chamber is laterally limited by a third cylindrical shell and said feed chamber is limited on bottom by the base and laterally by extensions of ~~inner and exterior~~ internal and external walls.

12. (previously presented) An apparatus for seawater or brackish water desalination as in claim 5.

13. (currently amended) An apparatus as in claim 12 wherein the final stage vapor chamber is ~~provided~~ enclosed by an upper vessel closed on the top and containing a final condenser for obtaining distilled water from ~~[[the]]~~ a final condenser stage of the apparatus.

14. (currently amended) An apparatus as in claim 13 including means for cooling the final condenser with cold salt water and to drive an eductor for obtaining vacuum in the first stage evaporator, the final stage evaporator, the pre-final stage condenser and the final condenser[[s]].

15. (currently amended) An apparatus as in claim 13 including means for ~~heating~~ admitting hot water as an energy source for the first stage evaporator of the apparatus.

16. (currently amended) An apparatus as in claim 13 including means for ~~pumping~~ conducting fresh water from the apparatus to storage.